one Rhomb-marked Snake (*Psammophis rhombeatus*), four Crossed Snakes (*Psammophis crucifer*), one Hygian Snake (*Elaps hygiæ*), two —— Snakes (*Dasypeltis scabra*) from South Africa, presented by Messrs. Herbert Melville and Claude Beddington; one Smooth Snake (*Coronella lævis*), two Common Snakes (*Tropidonotus natrix*) from Oxfordshire, presented by Mr. A. W. S. Fisher; one Otter (*Lutra vulgaris*) from South Wales, received in exchange; two White-tailed Sea Eagles (*Haliaëtus albicillay's*) from Norway, three Indian Python (*Python molurus*) from India, deposited; one Macaque Monkey (*Macacus cynomolgus*) from India, one Pardine Genet (*Genetta pardina*) from West Africa, purchased; one Vinaceous Turtle Dove (*Turtur vinaceus*), bred in the Menagerie.

OUR ASTRONOMICAL COLUMN.

LIGHTNING SPECTRA.—Mr. W. E. Wood, of Washington, has continued his observations of lightning spectra for the purpose of determining the origin of some of the lines previously recorded by him (NATURE, vol. xlii. p. 377). The result is that he is now able to say, in the *Sidereal Messenger* for August:—"Lightning spectra present but the characteristic lines of oxygen, hydrogen, nitrogen, and carbonic acid, and—what was puzzling to me—the line of the vapour of sodium. The absorption bands which I find in lightning spectra I think might be produced by the moisture in the air, a large quantity being present during thunderstorms." It is suggested that the sodium line owes its presence to the existence of meteoritic *débris* in the atmosphere.

A NEW ASTEROID.—The 315th asteroid was discovered by Charlois on September 1.

THE INTERNATIONAL GEOLOGICAL CONGRESS: WASHINGTON MEETING.

THE fifth meeting of the International Geological Congress, being the first ever held in America, was held at the Columbian University, Washington, from August 26 to September 1, with an attendance of sixty or seventy foreigners, from Austria-Hungary, Canada, Chili, France, Germany, Great Britain, Mexico, Peru, Roumania, Russia, Sweden, and Switzerland, and about two hundred members from the United States. The papers and discussions were generally in English, though French and German were to some extent spoken. French has been the language of all the previous Congresses.

Profs. James Hall and James D. Dana were elected Honorary Presidents, and J. S. Newbery Acting President. Owing to the absence of the latter, the chair was filled in turn by several of the Vice-Presidents.

FIRST DAY.—After the election of officers, as nominated by the bureau, Prof. Joseph Le Conte, as senior Vice-President, took the chair, and delivered the opening address, in which he said that the idea of an International Congress was born in America in 1876. Previous meetings have been held at Paris in 1878, Bologna in 1881, Berlin in 1885, and London in 1888. He briefly stated the purposes of this Congress, which were afterwards carried out—namely, to discuss classification of the Pleistocene rocks, of correlation, and of map notation. He compared the maps of Europe and America, showing the complexity of the former and the simplicity of the latter. He then considered some points in American geology:—(1) The general continuity of the record. (2) The prevalence of extensive faults, ranging from 100 to 2000 feet, and extending over great distances. (3) Peculiarities of mountain structure. Prof. Gilbert has discovered a new type of mountains formed by uptilted strata. The Sierra Nevada is an illustration. (4) Extensive lava floods, covering areas from 10,000 to 100,000 square miles in extent, and from 2000 to 4000 feet deep. No such floods are found elsewhere. Those of India are the nearest approximation; but in Europe the lava beds are small and much cut up. (5) The great continental movement, commencing in the later Tertiary, and terminating in the beginning of the Quaternary, which has caused changes of level amounting to 2500 or 3000 feet on both sides of the continent. (6) The ice-sheet of the glacial epoch was first and most completely demonstrated in America.

Other addresses were delivered by Mr. Hubbard, Chairman of the Local Committee; Mr. Noble, Secretary of the Interior, who has official control and supervision of the Geological Survey of the United States; Prof. Hughes of England, Prof. Gaudry of France, and Major Powell, Chief of the Geological Survey.

SECOND DAY.—The entire day was occupied by a discussion on classification of the glacial Pleistocene deposits. Prof. T. C. Chamberlin opened the discussion by stating that classification might be made on three grounds: (1) structural; (2) chronological; (3) genetic. The first was very easy, being an obvious division into assorted and unassorted drift. The second was extremely difficult, and could not be accurately made till after a full determination of the third. He accordingly proposed the following general classes: (1) formations produced by the direct action of Pleistocene glaciers; (2) formations produced by the combined action of Pleistocene glaciers and accompanying glacial drainage; (3) formations produced by glacial waters after their issuance from Pleistocene glaciers; (4) formations produced by floating ice derived from Pleistocene glaciers; (5) formations produced by shore ice and ice floes due to low Pleistocene temperature, but independent of glacier action; (6) formations produced by winds acting on Pleistocene glacial and glacio-fluvial deposits under the peculiar conditions of glaciation.

This paper was discussed very thoroughly. Prof. T. McK. Hughes pointed out that the classification suggested by Prof. Chamberlin was purely genetic. He then explained the abundance of striated boulders in one part of the glacial deposits and their absence in another. If the supply of material (that is, of rock bosses above the ice) ceases at any point, then all the boulders will gradually sink through the ice and become glaciated at the bottom. Prof. Hughes also thought that two distinct types of ridges formed of glacial material were confused under the names—kames, osars, and eskar. He also explained the "pitted plains" as due to an unusual interruption between the hills or ridges of eskar character. He expressed his opinion that the glacial period was a continuous one, in England at least, except for slight changes due to unimportant oscillations.

Mr. McGee mentioned the importance of land forms in interpreting geological processes. Any primary geological classification must be genetic. He discussed in detail the following scheme of classification of Pleistocene deposits:—

Classification of Pleistocene Formations and Land Forms.

A. Aqueous:
  1. Below base level.
    a. Marine.
    b. Estuarine.
    c. Lacustral.
  2. At base level.
    a. Littoral.
    b. Marsh.
    c. Alluvial (certain terraces, &c.).
  3. Above base level.
    a. Torrential.
    b. Talus (including playas).
B. Glacial:
  1. Direct (Chamberlin's Class I.).
  2. Indirect (Chamberlin's Classes II. to V., in part).
C. Aqueo-Glacial (Chamberlin's Classes II. to V., in part).
D. Eolic (Chamberlin's Class (?) VI.).
E. Volcanic:
  1. Direct.
    a. Lava sheets.
    b. Cinder cones.
    c. Tuffs, lapilli sheets, &c.
  2. Indirect.
    a. Ash beds.
    b. Lapilli sheets.

Prof. Chamberlin, in closing the discussion, said that there was great difficulty in applying a chronological classification, and that such a classification might even act as a barrier to observation and to the recognition of the truth. Chronological classification is the ultimate goal of glacial studies, but it is something for which we are not as yet prepared. Red, oxidized sub-soils are not developed in northern latitudes. Organic deposits between glacial layers are abundant in the West, but do not belong to a single horizon. Many facts of erosion and physical geology indicate that the Glacial epoch in America was widely differentiated and of long duration. How many distinct periods it embraced we do not as yet know.

Prof. Cope said an abundant tropical fauna is found in the "Equus beds," which, if they be of interglacial age, indicates at this time a very warm climate. This fauna is succeeded by a truly boreal fauna. In this is contained material for a chronological subdivision of Pleistocene deposits.

THIRD DAY.—The President announced as the subject for discussion, the correlation of geological formations.

Mr. Gilbert opened this discussion by presenting a general classification of methods of correlation.

Strata are locally classified by superposition in chronologic sequences. Geologic correlation is the chronology of beds not in visible sequence. For convenience in discussion, methods of correlation are classed in ten groups, of which six are physical and four biotic.

Physical Methods of Correlation.

(1) Through visible continuity. The outcrop of a bed is traced from point to point, and the different parts are thus correlated one with another.

(2) Strata are correlated on account of lithologic similarity. This method, once widely prevalent, is used where the distances are small.

(3) Correlation by the similarity of lithologic sequence has great and important use where the localities compared fall within the same geologic province, but is not safely used in passing from province to province.

(4) Physical breaks, or unconformities, have a limited use, especially in conjunction with other methods. The practice of employing them in the case of localities wide apart is viewed with suspicion.

(5) Deposits are also correlated with their simultaneous relations to some physical event—for example, a beach with the lake beds it encircles; a base level plane with a contiguous subaqueous deposit; and alluvial, littoral, and subaqueous deposits standing in proper topographic relation. In the Pleistocene, glacial deposits are widely correlated with reference to a climatic episode assumed to arise from some general cause.

(6) Deposits are correlated through comparison of changes they have experienced from geologic processes supposed to be continuous. Newer and older drift deposits in different regions are correlated according to the relative extent of weathering and erosion; induration and metamorphism afford presumptive evidence of age, but yield to evidence of other character. Metamorphism holds prominent place in the correlation of pre-Cambrian rocks where most methods are inapplicable.

These physical methods are qualified by the geographic distribution of geologic processes of change and of geologic climates.

Biotic Methods of Correlation.

(7) A newly-discovered fauna or flora is compared with a standard series of faunas and floras by means of the species it holds in common with them severally.

(8) It is also compared by means of representative forms, or through genera and families.

(7*a*) and (8*a*) These comparisons are strengthened if two or more faunas in sequence are found to be systematically related to the faunas of a standard series.

(9) Two faunas or floras otherwise related are compared in age through their relation to the present life of their localities. This method was applied by Lyell to Tertiary rocks.

(10) Faunas are correlated by means of their relation to climatic episodes taken in connection with station. For example, boreal shells found in latitudes below their present range are referred to glacial time.

In general the limitations to accurate correlation by biotic methods arise from the facts of geographic distribution. Correlations at short range are better than those at long range.

Biotic correlation by means of fossils of different kinds may have different value. In general, the value of a species for the purposes of correlation is inversely as its range in time, and directly as its range in space. The value of a biotic group depends (1) on the range of its species in time and space; (2) on the extent to which its representatives are preserved.

Prof. K. von Zittel spoke in reference to the biotic methods, and gave his opinion of the relative value of plants and animals for purposes of correlation. He regarded plants as relatively unimportant. Among animals, those which are marine, lacustrine, and land animals may be distinguished. Of these classes marine invertebrates are most valuable for purposes of correlation. The vertebrates change rapidly, but are frequently altogether wanting. For instance, no vertebrates occur in the Alpine beds corresponding in age to those which contain the mammalian fauna of the Paris basin. In certain lacustrine deposits invertebrates may be absent, and in such cases the vertebrate fauna is the surest guide.

Baron de Geer emphasized the importance of a numerical comparison between different species. The actual counting of individuals in a given formation is of great value.

Prof. Marsh expressed his agreement in general with the conclusions communicated by Prof. von Zittel, but would give special weight to vertebrate fossils. In the Mesozoic and Tertiary beds of the Rocky Mountains he had found that the vertebrates offer the surest guide for correlation. This is in part because invertebrates are either wanting or are lacustrine. Prof. Marsh in 1877 named a sequence of horizons after the most characteristic vertebrate genus in each which is confined exclusively to it. He presented an outline of such classification brought down to date, with a section to illustrate vertebrate life in America.

Mr. C. D. Walcott spoke of the value of plants for purposes of geologic correlation.

Prof. T. McK. Hughes spoke of the present and growing tendency towards a natural classification. The evidence is complex, and includes a considerable variety of diverse relations. He pointed out exceptions to the normal conclusions deduced from superposition, lithological character, and similarity of sequence. We must have a system of criteria so varied that if one or more fails others can be employed. All classes of evidence are useful, both positive, negative, and circumstantial.

Major J. W. Powell spoke of the necessity of specialization on the part of geologists engaged in the work of correlation. The evidence derived from physical and biotic facts might apparently disagree. But that a satisfactory result may be reached, these two classes of evidence must be brought into harmony. He cited an example from his own experience, of how an identification of synchronous formations might be made over a wide area through a union of physical and biotic methods.

Mr. W. J. McGee remarked that in the coastal plain of the United States physical correlation alone is employed. The bases accord with those outlined by Mr. Gilbert, with certain minor modifications and an important addition, as follows :—

For local discrimination and correlation	Visible continuity; Lithologic similarity; Similarity of sequence.
For correlation throughout the province... ...	Physical breaks viewed as indices of geography and topography.
For correlation with contiguous provinces ...	Relation to physical events, including continental movements, transportation of materials, land sculpture, &c.
For general correlation...	Homogeny or identity of origin.

By correlation upon these bases the physical history of a considerable fraction of the continent may be so definitely ascertained as to permit fairly accurate mapping of the geography, and even the topography of each episode in continent growth. After these episodes are clearly defined, and the fossils found in the formations are studied, it will be possible definitely to ascertain the geographic distribution of organisms during each episode; then palæontology may be placed on a new and higher plane.

Prof. W. M. Davis showed that it was possible to decipher geological history not only through the records of deposition, but also by processes of degradation. As an example of this method he explained a topographical section from the city of New York westward. In this we have evidence of the existence of an ancient *peneplain*, or base-level lowland of Cretaceous age. This surface was subsequently elevated (more toward the west than toward the east) at the end of Cretaceous, or at the beginning of Tertiary time. It has since been dissected by the excavation of more recent valleys. The Hudson Valley lowland was cited as an example of this recent dissection.

Prof. E. W. Claypole considered that the different methods of geologic correlation differed very greatly in their value. It is improbable that the plant or mammalian record will ever equal in its perfection that of the marine invertebrate fauna. The marine fauna is to the geologist what a primary triangulation is to the geodesist. It marks out the main divisions, which are subsequently further subdivided through the aid of other fossils, such as plants and vertebrates.

Prof. C. R. Van Hise spoke of the methods of correlation employed for pre-Cambrian rocks, which occur in widely separated areas and are devoid of fossils. Physical data only are available for correlating these formations. Experience has shown that, among all physical methods, unconformity is by far the most important. Other physical criteria, such as the degree of induration, metamorphism, and relation to eruptives, are valuable for the subdivision of single areas, but cannot be safely used in identifying synchronous formations in widely-separated areas. The idea that lithological character is any direct proof of geological age has retarded the scientific subdivision of pre-Cambrian rocks. The researches of Pumpelly and others in the eastern United States have demonstrated that Silurian, Devonian, and even Carboniferous deposits might become, under certain physical conditions, as highly crystalline as much more ancient rocks of the West. For this reason it has been found necessary to abandon such terms as *Huronian* and *Keweenawan*. Evidences of life are not lacking in pre-Cambrian rocks, and it is to be hoped that the palæontologist will succeed in differentiating several separate formations below the Cambrian, as the Cambrian itself was differentiated from the base of the Silurian.

FOURTH DAY.—Prof. E. W. Hilgard laid stress upon the importance of the abundance or scarcity of species in the correlation of strata. He thinks some quantitative estimation of the species should be made. He is of the opinion, also, that, as compared with marine fauna, plants have but little value for purposes of correlation owing to their local distribution, their accidental proximity to water, transportation, and preservation. Plants can be so used only after large areas are worked over.

Prof. Lester F. Ward continued the discussion. He developed two of the more general principles of correlation by means of fossil plants, as follows :—

(1) That the great types of vegetation are characteristic of the great epochs in geology.

This principle is applicable in comparing deposits of widely different age when the stratigraphy is indecisive. For example, even a small fragment of a Carboniferous plant proves conclusively that the rocks in which it occurs are palæozoic, or a single dicotyledonous leaf proves that they must be as late as the Cretaceous.

(2) That for deposits not thus widely different in age, as, for example, within the same geologic system or series, ample material is necessary to fix their position by means of fossil plants.

Neglecting this principle has led to the greater part of the mistakes of palæobotanists, and has done most to bring palæobotany into disrepute. Geologists have expected too much of them, and they, in turn, have done violence to the truth in attempting to satisfy extravagant demands. On the other hand, where the material is ample, fossil plants have often corrected the mistakes of stratigraphical geologists, and solved problems concerning geologic age, which seemed impossible of settlement by any other class of evidence.

Prof. Henry S. Williams laid stress upon the relations of species to the conditions of deposition. The abundance of a species varies with environment, and a study of correlation should embrace a study of these conditions. Sandstones deposited near shore may have a fauna different from that of a limestone deposited off shore at the same time, and a change of fauna may be induced by a change of the conditions of deposition. The age of beds should be determined by comparing species of the same genera rather than by comparing those of different genera. There are centres of abundance which exhibit great variability in their characters; outside of these centres the species exhibit varieties which may be called extralimital, and which are not typical though they have often been published as types.

Prof. Charles Barrois said that there was no general basis, either biologic or lithologic, for the correlation of the pre-Cambrian rocks of Europe with those of North America ; even the terms applied to these rocks were liable to be misunderstood. Certainly the divisions used in France cannot be correlated with those now used in the United States. General correlation cannot, as yet, be based upon nonconformities ; autopsy is the only basis upon which a comparison can be instituted. He pointed out certain parallelisms between the histories of the crystalline schists of America, as illustrated by Mr. Pumpelly, and the gneissic rocks of Brest, where the Cambrian slates are altered to gneisses of Archæan aspect, while the alternating fossiliferous quartzites are changed to crystalline quartz. Geologists must see the beds together in order to reach a common understanding of the crystalline rocks.

Prof. E. D. Cope discussed the question from a general point of view with especial reference to the value of vertebrates for purposes of correlation, particularly for inter-continental correlation. He pointed out that there is a marked difference in the present verebrate faunas of continents, and that the variation of such forms must be sought in vertical rather than in horizontal ranges. Such study shows that we have had invasions of a given region by a fauna from without ; for example, a South American fauna invaded North America at one time and then retreated, while a North American fauna once invaded South America, and traces of it still remain in that country. He is inclined to believe that certain vertebrate forms did not spread over the earth from a single place of origin, but that they originated at different places upon the earth. We have parallelism in separate places, but the parallelism is defective in the Laramie.

Mr. G. K. Gilbert was of the opinion that many methods of correlation must be used. He doubted the trustworthiness of the correlation of non-fossiliferous rocks by comparative change, even locally. He thought the abundance and scarcity of fossil forms comparable with lithologic differences, and considered the simple occurrence of a species as valuable for purposes of correlation as its abundance.

FIFTH DAY.—Subject for discussion : map-colouring and cartography.

Major J. W. Powell exhibited charts illustrating the colour system used by the U.S. Geological Survey, explained the methods of using the colours, and gave the reasons for them. The colours assigned to rocks of different ages are as follows :—

	Period.	Period colour.	Mark.
1.	Neocene	Orange	N.
2	Eocene	Yellow	E.
3.	Cretaceous	Yellow-green	K.
4.	Jura-Trias	Blue-green	J.
5.	Carboniferous	Blue	C.
6.	Devonian	Violet	D.
7.	Silurian	Purple	S.
8.	Cambrian	Pink	Ꞓ.
9.	Algonkian	Red	A.

The colours are used to designate geologic periods, patterns of these colours designate formations ; minor divisions are usually relegated to the text. The number of patterns for designating formations can be indefinitely enlarged, but follow a definite system.

Mr. Joseph Willcox showed that in the scheme described by Major Powell the colours were not evenly distributed through the chromatic scale.

Prof. C. R. Van Hise pointed out that Archæan rocks are shown by a brown underprint, and that metamorphic rocks of known age are given the colour of the corresponding unaltered rocks.

Major Powell explained that it was not attempted to select colours equally distributed through the chromatic scale, but to use those that may be most readily recognized.

Mr. H. M. Cadell asked why black and gray were not used.

Major Powell replied that blue was used in place of the dark shades for the Carboniferous ; that dark colours are misleading in regard to the occurrence of coal, which occurs in the Cretaceous and Tertiary as well as in the Carboniferous.

Mr. Christie found the black colour very inconvenient, because it often made the details of the map covered by such colours illegible.

Mr. H. M. Cadell said that the maps of the Geological Survey of Great Britain were coloured by hand, and that the system used by the U.S. Geological Survey could not for this reason be economically employed.

Major Powell explained that the U.S. Survey system is very economical when the colour patterns are transferred to stones.

Prof. T. McK. Hughes thought it very difficult to devise a scheme that will meet the demands of everyone. Some reference must be had to the permanence of the colours, the readiness with which they can be applied, and the distinctness with which they show what is desired. He thinks the fittest scheme must survive.

In the afternoon, brief lectures were given by Prof. Chamberlin, Mr. Gilbert, Major Powell, and Mr. Emmons upon the geology of the country to be traversed by the long excursion.

SIXTH DAY.—A Committee on International Bibliography was appointed.

The Secretary announced that Messrs. Golier and Schmidt convey an invitation from the Swiss Government to hold the sixth International Congress, in 1894, in Switzerland. Mr. Golier delivered an address in which he presented the invitation, and the Congress unanimously accepted it. The following Swiss members were appointed a local committee, with power to add to their number and to appoint the time and place of meeting: viz. Messrs. Heim, Renevier, Lang, Balzer, Schmidt, and Golier. On the motion of Prof. Pumpelly, a vote of thanks was passed to the Swiss Government and delegation. It is thought that Berne will be selected as the place of meeting.

The Geological Survey of Russia sent an invitation to hold the seventh Congress in Russia. The Czar joined in the invitation. Prof. Tschernychew made the formal presentation of the subject to the Congress. A vote of thanks to the Survey and the Czar was passed, and the Secretary of the Congress was authorized to send a despatch by cable, transmitting the vote.

The President of the Congress, Prof. Le Conte, delivered a brief closing address, summarizing the work of the session, and after passing several votes of thanks the Congress adjourned.

THE SOCIETY OF FRIENDS OF ASTRONOMY AND COSMIC PHYSICS.

THE Society of Friends of Astronomy and Cosmic Physics, founded May 19, 1891, has been formed with a view to the organization of systematic activity and co-operation in research in the subjects named. It is intended to embrace, chiefly, workers in astronomical science in Germany, Austro-Hungary, Switzerland, and other neighbouring countries, and natives of these countries in the colonies and elsewhere. Members of other nationalities are, however, offered a welcome.

The head centre of the Society is Berlin. The subscription is 5 marks.

Communications are invited from individual members, which will be published together with the notices of meetings and other business of the Society. These publications will bear the title "Mittheilungen der Vereinigung von Freunden der Astronomie und kosmischen Physik"; they will be numbered consecutively, and will be supplied to all members gratis, but will not be issued at regular or stated intervals.

These communications will form at present the only direct publication of the Society, until it is formed on a more substantial financial basis and consists of a larger number of members (in the first four weeks the number rose from 50 to over 100). Contemporaries are at liberty to borrow any matters of interest contained in the Society's communications, of course acknowledging the source from which they are derived.

Endeavours will be made to keep the Society carefully within the limits in which alone it can be successfully active, leaving on one side other closely related branches: for instance, those of the Meteorological and Photographic Societies; but, nevertheless, endeavouring to preserve the closest amity and co-operation with the related Societies.

The Astronomische Gesellschaft, founded in Germany in 1863, is regarded by the new Society as the principal Society, whose office it is to foster astronomical research throughout the whole earth. The new Society bears the same relation to this international association as do those Astronomical Societies already established in England, France, Russia, and North America.

The principal object of these smaller societies is to collect observations made in the largest possible number of districts, inasmuch as researches in astronomy and cosmic physics are very largely dependent on the state of the weather, and the relation of the place of observation to the phenomena in the heavens.

In the new Society the following branches of work have been selected:—(1) Observations of the sun; (2) of the moon and surface of the planets; (3) of the intensity and colour of the light of the stars and of the Milky Way; (4) of the zodiacal light and meteors; (5) of the polar light, magnetism of the earth, earth currents, and air electricity; (6) of the clouds and halos, and thunder and lightning (care being taken in the two last groups not to encroach upon the ground already covered by the Meteorological and Photographic Societies).

Each of these groups is presided over by a member of the Society whose attention is especially directed to the respective subject. The duty of these Presidents is to organize the correspondence, hold branch meetings, and preserve the connection which binds each group to all the others.

The Society will endeavour to further the organization of all these researches, not merely by the publication of communications and by correspondence, but also by advice and aid in the providing of apparatus, especially of suitable optic, electric, and magnetic measuring instruments, charts, books, &c.

The statutes of the Society will be sent post free on application to the Secretary, Herrn Cand. G. Witt, Berlin, N.W., Invalidenstrasse 57.

The President of the Society is at present Prof. Dr. R. Lehmann-Filhés, Berlin, W., Wichmannstrasse 11*a*.

The Committee consists of the six members presiding over the several groups of research.

The Librarian of the Society is Herr Dr. P. Schwahn, Berlin, N.W., Invalidenstrasse 57; and the Treasurer, to whom subscriptions should be sent, Herr Rendant Bruck, Berlin, N.W., Invalidenstrasse 57.

THE PROTECTIVE DEVICE OF AN ANNELID.

AMONGST a gathering of small Serpulids, &c., received from Mr. Sinel, of Jersey, I find some interesting little worms related to the Sabellidæ. They build a thin membrane-like tube, about one-seventieth of an inch in diameter, coated externally with flat translucent particles of sand. Its lower end is closed, and embedded in sponge or other growths, but the upper end is free, and, when the head of the inmate is protruded, stands about a quarter of an inch high in the water. On this head are two branchial tufts, each having five branches beset with a double row of long ciliated filaments. When all are fully expanded they curve backwards, and cover an area of about one-tenth of an inch in diameter. The branches decrease in size from the inner to the outer pairs, and at the back of the longest but one in each tuft, near its base, is a chocolate or brown coloured vesicle. The two smallest branches curve backwards round the mouth of the tube, and keep up a constant whipping or flicking motion.

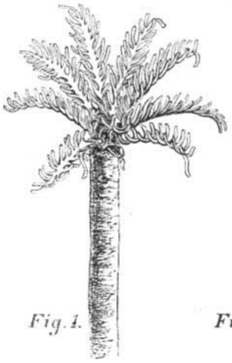
Fig. 1.

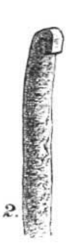
Fig. 2.

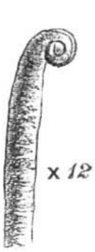

Fig. 3.

But the peculiarity is, that, upon the retreat of the animal, the mouth of the tube not only instantly closes flatly and tightly by collapse of the sides, but the tube itself, beginning at the tip, proceeds to coil up like a spiral spring, looking very much like a young fern-frond. This is, of course, an effectual protection against the intrusion of enemies, and the coiling and uncoiling, which I have witnessed many times, is a most curious sight.

Fig. 1 shows the branchial tufts expanded. Fig. 2, tube beginning to coil up. Fig. 3, tube partly coiled up—a process which is